

CLAIMS:

1. A diagnostic method for predicting maintenance requirements in rotating equipment normally operating in loaded and unloaded conditions, the method including the following steps;
5 coupling a sensor to apparatus associated with said rotating equipment, said sensor being responsive to vibration in said apparatus to generate an electric signal;
 obtaining a load signal from apparatus associated with said rotating equipment which is indicative of whether the rotating equipment is loaded;
 sampling said electric signal when the rotating equipment is loaded over a predetermined
10 sampling time interval to obtain a loaded electric signal V_l ;
 sampling said electric signal when the rotating equipment is unloaded over a predetermined sampling time interval to obtain an unloaded electric signal V_u ; and
 periodically displaying the relative magnitude between said loaded electric signal V_l and said unloaded electric signal V_u over an extended maintenance period of time, a maintenance
15 inspection being required when the magnitude of the unloaded electric signal V_u exceeds the magnitude of the loaded electric signal V_l .
2. A diagnostic method according to Claim 1 in which the sensor is selected from the group comprising a velometer and an accelerometer.
20
3. A diagnostic method according to Claim 1 in which the electric signal generated is either current or voltage.
4. A diagnostic method according to Claim 1 in which the sensor includes a piezoelectric
25 crystal.
5. A diagnostic method according to Claim 1 in which the rotating equipment is a drive spindle for a work roll and the load signal is indicative of whether the work roll is applying pressure to a work piece or whether the work piece has exited the work roll.
30
6. A diagnostic method according to Claim 1 in which the electric signal is sampled during a sampling time interval selected to correspond to a predetermined vibration frequency range.

7. A diagnostic method according to Claim 6 in which the predetermined vibration frequency range during which the electric signal is sampled is 0 to 150 Hz for rotating equipment rotating at less than 100 revolutions per minute.
- 5 8. A diagnostic method according to Claim 6 in which the predetermined vibration frequency range during which the electric signal is sampled is 0 to 200 Hz for rotating equipment rotating at up to 700 revolutions per minute.
9. A diagnostic method according to Claim 6 in which the predetermined vibration
10 frequency range during which the electric signal is sampled is 0 to 500 Hz for rotating equipment rotating at more than 1000 revolutions per minute.
10. A diagnostic method according to Claim 1 in which the said loaded electric signal V_l is sampled over a time interval of 10 seconds during which the rotating equipment is fully loaded.
- 15 11. A diagnostic method according to Claim 1 in which the said unloaded electric signal V_μ is sampled over a time interval of 10 seconds during which the rotating equipment is unloaded.
12. A diagnostic method according to Claim 1 in which sampling of the unloaded electric
20 signal V_μ begins a predetermined period of time after the load signal indicates that the rotating equipment is not loaded.
13. A diagnostic method according to Claim 1 in which the loaded and unloaded electric signals V_l and V_μ correspond to the maximum electric readings taken during said
25 predetermined sampling time interval.
14. A diagnostic method according to Claim 1 in which electric readings corresponding to the loaded and unloaded electric signals V_l and V_μ are averaged during said predetermined sampling time interval to generate an average electric signal.
- 30 15. A diagnostic method according to Claim 14 in which an alert signal corresponding to the

arithmetic ratio R between electric readings corresponding to V_l and V_μ is generated and displayed visually.

16. A diagnostic method according to Claim 15 in which a daily average of the arithmetic ratio R is plotted over time.
17. A diagnostic method according to Claim 15 in which the natural logarithmic of the ratio R is plotted over time.
18. A diagnostic method according to either Claim 16 or 17 in which the slope of the plot is monitored.
19. A diagnostic method for predicting maintenance requirements in rotating equipment normally operating in loaded and unloaded conditions, the method including the following steps:
- coupling a sensor to apparatus associated with said rotating equipment, said sensor being responsive to vibration in said apparatus to generate an electric signal;
 - obtaining a load signal from apparatus associated with said rotating equipment which is indicative of whether the rotating equipment is loaded;
 - calculating a range of average maximum and average minimum electric signal readings over a pre-selected sampling time interval for rotating equipment in a loaded condition;
 - calculating a range of average maximum and average minimum electrical signal readings over a pre-selected sampling time interval for rotating equipment which is not loaded;
 - calculating the natural log of the ratio of an average loaded to average unloaded range value to define a condition index;
 - periodically displaying the condition index over an extended maintenance period of time, a maintenance inspection being required when the condition index falls below a predefined threshold.